Tentative 3-A Sanitary Standard for Farm Raw Milk Storage Tanks,

Number B-30-01-A

Standards Developing Organizations
3-A Sanitary Standards, Inc. (3-A SSI)
In collaboration with
United States Public Health Service (USPHS)/
United States Food and Drug Administration (USFDA)
United States Department of Agriculture (USDA)
European Hygienic Engineering & Design Group (EHEDG)

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Disclaimers

3-A Sanitary Standards and 3-A Accepted Practices are developed through the efforts of experts, working on a volunteer basis, using science-based information and their professional experiences to reach consensus decisions on the sanitary (hygienic) criteria in these 3-A documents.

3-A Sanitary Standards Inc. (SSI), its employees and its volunteer committees/working groups shall not incur any obligation or liability for damages, including consequential damages, arising from or in connection with the development, use, interpretation, or reliance upon this 3-A Sanitary Standard.

3-A Sanitary Standards and 3-A Accepted Practices do not include provisions for mechanical, electrical, or personnel safety. Such safety criteria are established by government regulations and other standards development organizations (SDOs). Other SDO standards may be referenced.

Drawings and illustrations contained herein are examples to assist in understanding the criteria in this 3-A Sanitary Standard. Appendix illustrations are not intended to show all variations of the equipment or system nor are they exclusive of alternate approved methods. Appendix illustrations are non-normative.

Metric conversions are provided for convenience and are not intended to be mandatory.

The Appendix is an advisory or informative section unless specifically cited in the Materials or Fabrication Section as requiring conformance.

Foreword

This 3-A Sanitary Standard establishes minimum sanitary (hygienic) requirements for design, materials, fabrication, and/or installation of Farm Raw Milk Storage Tanks.

This 3-A Sanitary Standard is for use on a voluntary basis by directly and materially affected organizations such as equipment and machinery fabricators, processors, and regulatory agencies, and by other SDOs to assure that adequate public health protections exist for the equipment or systems and covered products. 3-A SSI uses these documents as its source of sanitary criteria for 3-A Symbol authorization.

This 3-A Sanitary Standard was developed jointly by 3-A SSI, the United States Public Health Service (USPHS), United States Food and Drug Administration (USFDA), the United States Department of Agriculture – Dairy Programs (USDA), and the European Hygienic Engineering & Design Group (EHEDG).

It is our intent to encourage inventive genius and provide a forum to discuss new developments. Suggestions for improvement and new technology are welcome at any time for consideration by 3-A SSI. Please forward comments to: 3-A SSI, 6888 Elm Street, Suite 2D, McLean, VA 22101-3829, USA or by fax: 703-761-6284, or by e-mail to: 3-ainfo@3-a.org.
A SCOPE

A1 This 3-A Sanitary Standard covers the sanitary aspects of storage tanks in which bulk milk product is stored on dairy farms. They do not pertain to storage tanks nor to silo type tanks for milk and milk products used in dairy processing plants nor do they pertain to farm milk cooling and holding tanks covered by 3-A Sanitary Standard for Farm Milk Cooling Tanks, Number 13-. Product enters at the inlet and exits at the outlet.

A2 Tanks made in conformance to this 3-A Sanitary Standard will prevent a significant increase in the temperature of the milk product stored in the tank by the insulation or by the combination of the insulation and maintenance refrigeration. These tanks will not provide the means for reducing the temperature of cooling the product milk.

A3 In order to conform with these 3-A Sanitary Standards, farm raw milk storage tanks shall comply with conform to the following design, material and fabrication criteria.

Note: check that scope still works at the end of draft review.

B NORMATIVE REFERENCES

B1 The following listed 3-A Sanitary Standards, 3-A Accepted Practices and other documents shall be considered as Normative References and the provisions of the referenced documents shall apply to this Standard without further reference in this document unless necessary to describe special considerations.

B2 3-A Sanitary Standards

Doc. No. Title (3-A Sanitary Standard for:)

00- General Requirements
33- Metal Tubing
51-
52-
53-
55-
57-
63- Sanitary Fittings
65-
73-
74- Sensors and Sensor Fittings and Connections Used on Equipment
78-
84-
85-
88-
B3 3-A Accepted Practices

Doc. No.  Title (3-A Accepted Practice for:)

604-  Supplying Air Under Pressure in Contact with Product, and Product Contact Surfaces
606-  
611-  

B4 Other References and Standards

1. AISI Steel Products Manual, Stainless & Heat Resisting Steels, Table 2-1. American Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086, Phone: (412) 776-1535.

2. Steel Founders Society of America, 780 McArdle Dr., Unit G, Crystal Lake, IL 60014, Phone: (815) 455-8240, Fax: (815) 455-8241, Internet: www.sfsa.org

3. ASTM specifications for Cast Grades A351/A351M, A743/A743M and A744/A744M. Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Phone: (610) 832-9500.


5. ANSI/American Society of Mechanical Engineers (ASME) B46.1 - Surface Texture Waviness and Lay. Available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017-2392, Phone: (212) 705 7722.


7. ISO 3601-1: The International Organization for Standardization (ISO), 1; Rue de Varembe, Case Postale 58, CH-1 2111, Geneva, Switzerland, Phone: +41 22 734 1240.


1. Official Methods of Analysis: Available from the AOAC International, 481 Frederick Ave., Ste. 500, Gaithersburg, MD 20877-2417. Phone (301) 924-7077; Fax (301) 924-7089. E-mail: AOAC@aoac.org.

12. Steel Founders Society of America, 780 McArdle Dr., Unit G, Crystal Lake, IL 60014 Phone: (815)455-8240 Fax:(815)455-8241 Internet: www.sfsa.org.

13. Official Methods of Analysis. Available from the AOAC International, 481 N. Frederick Ave., Suite 500, Gaithersburg, MD 20877-2417. Phone (301) 924-7077; Fax (301) 924-7089. E-mail: AOAC@aoac.org.


C DEFINITIONS

For the purpose of this Standard, the most current approved version of the 3-A Sanitary Standard for General Requirements, 00- shall apply, unless otherwise noted herein with additions, clarifications, exceptions, modification or exclusions.

Inlet: The point where the product enters the tank. The inlet may be the same fitting as the outlet.

**BC1 Products:** Shall mean Raw milk.

**BC2 Farm Milk Storage Tank:** Shall mean An insulated cylindrical, rectangular, oval or other equally satisfactorily shaped tank. having a capacity for product of at least 1500 gal. (5678 L).

**BC3 Surfaces**

**BC3.1 Product Contact Surfaces:** Shall mean all surfaces which are exposed to the product and surfaces from which liquids may drain, drop or be drawn into the product.

**BC3.2 Nonproduct Contact Surfaces:** Shall mean all other exposed surfaces.

**B4C3 Lining:** Shall mean All surfaces used to contain the product, including the ends, sides, bottom and top.

**B5C4 Shell:** Shall mean The material covering the exterior of the insulation and, if provided, the refrigerated surface.

**B6C5 Breast:** Shall mean That portion of the metal used to join the top of the lining to the top of the shell on an open top type tank.
Outlet: Shall mean The opening in the lining and the passage for milk to the exterior of the tank. The outlet passage starts at the opening in the lining and terminates at the connection for the outlet valve.

Mechanical Cleaning or Mechanically Cleaning: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.
MATERIALS

The most current approved version of the 3-A Sanitary Standard for General Requirements shall apply, unless otherwise noted herein with additions, clarifications, exceptions, modification or exclusions.

Product Contact Surfaces (Refer to 3-A Sanitary Standard for General Requirements, 00-)

Metals (Refer to 3-A Sanitary Standard for General Requirements, 00-)

Product contact surfaces shall be of stainless steel of the American Iron and Steel Institute (AISI) 300 Series \(^1\) or corresponding Alloy Cast Institute (ACI) types \(^2\) (See Appendix, Section EG), or metal which under conditions of intended use is at least as corrosion resistant as stainless steel of the foregoing types, and is nontoxic and nonabsorbent, except that:

Non-Metals (Refer to 3-A Sanitary Standard for General Requirements, 00-)

1. Rubber and rubber-like materials may be used for slingers, drip shields, agitator seals, agitator bearings, protective caps for sanitary tubes or fittings or vents, O-rings, seals, gaskets and parts used in similar applications. These materials shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-.

2. Plastic materials may be used for slingers, drip shields, agitator seals, agitator bearings, protective caps for sanitary tubes or fittings or vents, O-rings, seals, gaskets, direct reading gauge tubes, moisture traps on vacuum lines, in sight and/or light openings and parts used in similar applications. These materials shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-.

Except for the protective caps provided for in C1.1 and C1.2, sanitary fittings shall be made of materials provided for in the 3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products, Number 63-.

Glass may be used for direct reading gauge tubes and in sight and/or light openings. Glass when used shall be of a clear, heat resistant, type shatter-resistant, inert, nonporous, nontoxic, nonabsorbent, and insoluble when exposed to the conditions encountered in the environment of intended use, and in cleaning and sanitization or sterilization.

\(^1\) The data for this series are contained in the AISI Steel Products Manual, Stainless & Heat Resisting Steels, November 1990, Table 2-1, pp. 17-20. Available from the American Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412) 776-1535.

\(^2\) Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016 (708) 299-9160.
C1.2.5 Carbon and/or ceramic materials may be used. Where materials having certain inherent functional purposes are required for specific applications, such as bearing surfaces and rotary seals, Ceramic materials shall be inert, nonporous, nontoxic, nonabsorbent, insoluble, resistant to scratching, scoring, and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C1.2.6 The materials used for lining shall not be less than 18 U.S. standard gauge.

D2 Nonproduct Contact Surfaces (Refer to 3-A Sanitary Standard for General Requirements, 00-)

CD3 All nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used shall adhere. All nonproduct contact surfaces shall be relatively nonabsorbent, durable, and cleanable. Parts removable for cleaning having both product contact and nonproduct contact surfaces shall not be painted.

DE FABRICATION OF PRODUCT AND SOLUTION CONTACT SURFACES

The most current approved version of the 3-A Sanitary Standard for General Requirements shall apply, unless otherwise noted herein with additions, clarifications, exceptions, modification or exclusions.

E1 Surface Texture (Refer to 3-A Sanitary Standard for General Requirements, 00-)

D1.1 All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets. (See Appendix, Section F2.) The measuring rod of an immersion type measuring device, if made of stainless steel, may have a dull finish to facilitate reading.

E2 Joints

E2.1 Permanent Joints (Refer to 3-A Sanitary Standard for General Requirements, 00-)

D2 All permanent joints in product contact surfaces shall be welded except that rolled on sanitary pipeline ferrules or flanges may be used on connections beyond the shell. All welded areas of product contact surfaces shall be at least as smooth as the adjoining surfaces.

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3 Carbon which is specifically in compliance with the Food, Drug and Cosmetic Act, as amended, is that which is included in “V Fillers” in the food additive regulation for rubber articles intended for repeated use, 121.2562 of Sub-part F Code of Federal Regulations, Title 21 – Food and Drugs.
### E3 Cleaning and Inspectability
(Refer to 3-A Sanitary Standard for General Requirements, 00-)

**D3** All product contact surfaces shall be easily accessible for cleaning, either when in an assembled position or when removed. Removable parts shall be readily demountable.

**D19**

- **E3.1** Cleaning: Tanks having an inside height of more than 96 in. (244 mm) shall be provided with means (see Appendix, Section G5.1) that will facilitate manual cleaning and inspection of all product contact surfaces or means shall be provided for mechanically CIP cleaning the product contact surfaces of the tank and all nonremovable appurtenances thereto.

### E4 Draining
(Refer to 3-A Sanitary Standard for General Requirements, 00-)

**D4**

- **E4.1** All product contact surfaces shall be self-draining except for normal clingage. The tank shall be designed and constructed so that when it is level or when it is in the position in which it was calibrated or when it is in position for calibrating, the bottom shall slope at least 1/4 in. per foot (21 mm per m) toward the outlet, or if the tank is a vertical tank designed for mechanical CIP cleaning, the bottom shall pitch at least 3/4 in. per ft (63 mm per m) toward the outlet. The lining shall be constructed so that it will not sag, buckle or become distorted in normal use. If the tank is designed for use on a vacuum system, the construction shall be such that the lining will not be distorted when the internal pressure is 20 in. (508 mm) of mercury below atmospheric pressure. Horizontal tanks shall be so constructed that they will not prevent complete drainage of water when the tank has a slope of not more than 1 in. in 100 in. (1%).

### E5 Gaskets, Gasket Retaining Grooves, O-rings and Seals
(Refer to 3-A Sanitary Standard for General Requirements, 00-)

**D5** Gaskets shall be removable. Any gasket groove or gasket retaining groove shall not exceed 1/4 in. (6.35 mm) in depth or be less than 1/4 in. wide except those for standard O-rings smaller than 1/4 in. (6.35 mm).

### E6 Radii
(Refer to 3-A Sanitary Standard for General Requirements, 00-)

**D6**

- **E6.1** The radii where the head and side walls of the vessel join shall have minimum radii of 1/2 in. (12.70 mm), except that:

**D6.4**

- The minimum radii for accessories, appurtenances, or bridges that are welded to product contact surfaces shall be not less than 1/4 in. (6.35 mm).

**D6.2**

- The minimum radii in agitator shaft bottom guide bearings and in gasket grooves or gasket retaining grooves other than those for standard 1/4 in. (6.35 mm) and smaller O-rings shall be not less than 1/8 in. (3.18 mm).

**D6.3**

- The minimum radii in grooves for standard 1/4 in. (6.35 mm) O-rings shall be not less than 3/32 in. (3.99 mm) and for standard 1/8 in. (3.18 mm) O-rings shall be not less than 1/32 in. (0.794 mm).
The minimum radii of covers and agitator assemblies shall be not less than 1/4 in. (6.35 mm).

Threads (Refer to 3-A Sanitary Standard for General Requirements, 00-)

There shall be no threads on product contact surfaces.

Openings and Covers (Other Than Personnel Access Ports) (Refer to 3-A Sanitary Standard for General Requirements, 00-)

Main Covers for Open Top Type Tanks
Main covers (1) shall be sufficiently rigid to prevent buckling, (2) shall be self-draining, (3) shall be provided with an adequate, conveniently located and durable handle(s) of sanitary design, which is welded in place or formed into the cover material, (4) unless gasketed, shall have downward flanges not less than 3/8 in. (9.52 mm) along all edges and (5) shall be close fitting. If the cover is not gasketed, the clearance between the surface of the cover and the surface of the tank it is designed to contact shall not exceed 3/32 in. (3.99 mm). Covers not exceeding 24 x 30 in. (610 x 762 mm) or 30 in. (762 mm) in diameter may be removable and shall be designed to be self-draining in the closed position.

Nonremovable Covers for Open Top Type Tanks
Nonremovable covers (1) shall be of a type that can be opened and maintained in an open position, (2) shall be designed to be self-draining when in the closed position, (3) shall be designed so that when the covers are in any open position liquid from the exterior surface will not drain into the lining and (4) shall be designed so that when in their fully opened position, drops of condensation on the underside will not drain into the tank, and (5) unless gasketed, shall have downward flanges not less than 3/8 in. (9.52 mm) along all edges and (6) shall be close fitting. Covers of openings that will be held in place by gravity or vacuum may be of the lift-off type and may be provided with a clamp(s) or other device to maintain them in position.

Bridges and Fixed Covers for Open Top Type Tanks
Bridges and fixed covers shall pitch to the outside edge(s) of the tank for complete drainage, and shall have a raised flange not less than 3/8 in. (9.52 mm) in height where the edge(s) meets the main cover(s). Bridges and fixed covers shall be integral or welded to the lining and shall be installed so the underside is accessible for cleaning and inspection without completely entering the tank. Bridges shall not exceed 24 in. (610 mm) in width.

Generally horizontal fixed covers, located at ends or sides of an open top type tank (or segments of cylindrical open top type tanks) with generally vertical side walls, shall not extend more than 12 in. (305 mm) over the surface of the product.

Openings and Covers (Other than Personnel Access Ports) refer to GR…: except that:

Manhole Covers for Closed Type Tanks
Covers for manholes in side walls shall be either the inside or outside swing type. If the cover swings inside, it shall also swing outside, away from the opening. Threads or ball joints employed to attach the manhole cover(s) and its appendages shall not be located within the lining. Covers for manholes in the top of tanks shall be of the outside swing type or be of a removable type.

D10.5E9.1 All openings in the lining or in fixed covers or in bridges, or main covers of open top type tanks not continually in use shall be provided with removable covers, which are designed to make close contact with the upper edges of the opening or cover surface, and when in the main cover the Removable cover(s) in the main cover shall remain in position when the main cover is in an open position.

D10.6 An umbrella or drip shield of sanitary design that can be raised or dismantled, to permit cleaning of all of its surfaces, shall be provided to protect against the entrance of dust, oil, insects and other contaminants into the tank through the space around the agitator shaft.

D11 Openings

The edges of all openings into the lining that are upward or horizontal shall extend upward or outward at least 3/8 in. (9.52 mm) beyond the shell or be fitted with a permanently installed sanitary pipeline fitting.

Meeting ended 4/18/17

D11.1 E8.9 The main opening(s) of tanks shall be of sufficient number, adequate in size, and so located that all product contact surfaces are easily accessible and, except for the product contact surfaces of parts removable for cleaning, can be inspected visually without entering the tank, except for D11.2 An exception to the requirements of D11.1 is made for closed top type tanks, having product contact surfaces that cannot be manually cleaned and inspected without entering the tank.

D11.2.1 E8.9.1 The minimum inside height of this type of tank shall be 42 in. (107 cm) and if the inside height exceeds 96 in. (244 cm), means shall be provided (see Appendix, Section G5.1) that will facilitate manual cleaning and inspection of all product contact surfaces or means shall be provided for mechanically cleaning the product contact surfaces of the tank and all nonremovable appurtenances thereto. This type of tank shall have a manhole opening(s) complying with conforming to the provisions of D11.5E8.12.

D11.3 E8.10 An inlet sanitary pipeline connection shall be at least 1 1/2 in. (38.1 mm) or the inlet opening shall accommodate at least 1 1/2 in. (38.1 mm) 3-A sanitary tubing.

D11.4 E8.11 Agitator openings: Agitator shaft openings through the bridge or top enclosure shall have a minimum diameter of 1 in. (25.4 mm) on tanks which require removal of the agitator shaft for cleaning or be of a diameter that will provide a 1 in. (25.4 mm) minimum annular cleaning space between the agitator
shaft and the inside surface of the flanges opening on tanks which do not require removal of the agitator for cleaning.

**D11.5**

Manhole openings: A manhole opening, if provided, shall be located at the outlet end or side of the tank or the top of the tank. The inside dimensions of the manhole opening shall not be less than 15 x 20 in. (381 x 508 mm) oval, 12 x 27 in. (305 x 686 mm) elliptical, or 18 in. (457 mm) diameter.

**D11.6**

Sight and Light Openings: Sight and light openings shall be provided when no other opening is available for viewing the surface of the **product**, **milk** and shall be of such design and construction that the inner surfaces drain inwardly, and if the tank is designed for mechanical cleaning, the inner surface of the glass (or plastic) shall be relatively flush with the inner surface of the lining. The inside diameter of the opening, if only one is provided, shall be at least 5 3/4 in. (146 mm). If two openings are provided, the inside diameter of each shall be at least 3 3/4 in. (95.25 mm). The external flare of the opening shall be pitched so that liquid cannot accumulate.

**D11.7**

Thermometer openings: Two connections or openings shall be provided which will accommodate thermometer sensing elements for an indicating and recording thermometer. Connections and/or openings shall be located in the top enclosure, cover, bridge or through an end or sidewall. Thermometer wells may be used. The bulb of the temperature sensing element shall be located so as to permit registering the product temperature when the tank contains no more product than 10% of its capacity and if the tank has provisions for cooling, it shall be located so that the sensing element is not influenced by the cooling medium. All connections and/or openings shall conform to one of the following:

**D11.7.1** The applicable fittings found in the 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Fluid Milk and Milk Products Equipment, Number 74.

**D11.7.2** Fittings for temperature sensing devices which do not pierce the tank lining, but which have temperature sensing element receptacles securely attached to the exterior of the tank lining.

**D11.8**

The vacuum connection for a tank designed to be operated under vacuum shall be standard stainless steel tubing not less than 1 1/2 in. (38.1 mm) in diameter and not longer than 4 in. (102 mm). (See Appendix, Section H8.)

**D12**

Outlet: The outlet shall provide complete drainage of the tank and shall have an outside diameter conforming to that of 2 in. (50.8 mm) or larger 3-A sanitary tubing and a wall thickness no greater than 1/8 in. (3.18 mm). The terminal end of the outlet passage shall have a rolled-on or a welded sanitary pipeline ferrule or flange. The ferrule or flange shall not be below the bottom of the shell. The distance between nearest point on the shell to the face of the ferrule or flange on the terminal end of a horizontal type outlet shall not be more than the smaller of (1) twice the nominal diameter of the outlet passage or (2) five in. (127 mm). The outlet shall be one of the following types:
D12E.17.1 Horizontal type. The bottom of the outlet passage shall be at least as low as the low point of the lining at the outlet. The outlet passage shall be pitched downward toward the terminal end.

D12E.17.2 Vertical type. The vertical centerline of the outlet passage shall be as close as practical to a side wall of the tank. The outlet passage shall be a generally horizontal extension of an elbow which is a part of or is welded to the lining.

The outlet passage shall not pass through the bottom of the shell if product will be held in the passage.

E9 Temperature-Sensing Device Connections (Refer to 3-A Sanitary Standard for General Requirements, 00-)

D17E.9.1 Thermometers: Each tank shall be provided with an analog or digital indicating thermometer, and means for installing a recording thermometer and/or a recording thermometer complying with conforming to the applicable specifications for indicating and recording thermometers in Appendix Section in Section E9.

The thermometer or the temperature sensing elements of the indicating and recording thermometers shall fit one of the connections or openings provided for in D11.7.1 and D11.7.2 E.15.1.

E10 Agitators

D14E.10.1 Agitators: Means for mechanical and/or air agitation shall be provided that will result in a variation in milk fat content of the product in the tank of not more than ±0.1% as determined by an Official AOAC Milk Fat Test, when the tank is filled to at least 50% of its capacity with product and the agitator has been in operation for 10 minutes. Agitators, if not designed for mechanical cleaning, shall be readily accessible for manual cleaning and inspection either in an assembled position or when removed. A seal for the agitator shaft, if provided, shall be of a packless type, sanitary in design with all parts readily accessible for cleaning. A sanitary seal for the agitator shaft shall be provided for (1) a horizontal agitator, (2) a vertical agitator when it is specified that the tank is to be located so that the portion of the shaft outside the tank is not in the milk house or milk room, (3) a tank designed to be operated under vacuum and (4) an agitator in a tank having means for mechanically cleaning the tank. The means for agitation shall be one of the following:

D14E.10.2 Mechanical, top entering, nonremovable type.

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4 The method of making these tests will be found in the following reference: Official Methods of Analysis. Available from the AOAC International, 481 N. Frederick Rd., Suite 500, Gaithersburg, MD 20877-2417. Ph: 301-924-7077; Fax: 301-924-7087; E-mail: aoac@aoac.org.
There shall be at least a 1 in. (25.4 mm) space between the nonremovable agitator and the bottom of the lining, unless the agitator is mounted on a hinged type cover. A bottom shaft bearing shall not be provided for a nonremovable type agitator.

D14.2E10.3 Mechanical, top entering, removable type.
This type of agitator shall be provided with an easily accessible, readily demountable coupling of either a sanitary type located within the lining or a coupling located outside the lining, provided that it is above the shield provided to protect the annular space around the shaft. All product contact surfaces of the agitator shall be visible when the agitator is removed. A bottom support or guide, if used, shall be welded to the lining, shall not interfere with drainage of the tank, and the inside angles shall have minimum radii of 1/8 in. (3.18 mm). When the agitator shaft has a bearing cavity, the diameter of the cavity shall be greater than the depth. The agitator shall be easily demountable for cleaning of the bearing and any shaft cavity.

D14.3E10.4 Mechanical side entering type.
This type of agitator, shaft and complete seal, if not designed for mechanical cleaning shall be readily demountable for manual cleaning. Nonremovable parts having product contact surfaces shall be designed so that the product contact surfaces are readily cleanable from the inside of the tank.

D14.4E10.5 Air agitation.
The means for air agitation shall comply with the applicable provisions of D15 E10.6.

D15E10.6 Air for Agitation or Movement of Product: Means for applying air under pressure shall conform to the applicable provisions of the 3-A Accepted Practices for Supplying Air Under Pressure in Contact with Milk, Milk Products and Product Contact Surfaces, Number 604-, and the following:

D15.3E10.7 Permanently mounted air tubing shall be constructed and installed so that it will not sag, buckle, vibrate or prevent complete drainage of the tank or tubing and shall be located so that the distance from the outside of the tubing to the lining shall be at least two inches, except at point of entrance.

D16E10.8 Mechanical Agitator Driving Mechanism Mounting:
The driving mechanism when above the lining shall be securely mounted in a position that will provide a minimum distance of 4 in. measured vertically downward from the bottom of the driving mechanism housing, excluding bearing bosses and mounting bosses to the nearest surface of the tank; and in such a manner that all surfaces of the tank under or adjacent to the driving mechanism shall be readily accessible for cleaning and inspection.

E11 Instruments

E11.8E11.1 Instruments: A diaphragm pressure or level sensor, when provided, shall comply with the applicable provisions of the 3-A Sanitary Standards for Sensor and Sensor Fittings and Connections Used on Fluid Milk and Milk Products Equipment, Number 74-.. When the tank is
designed for CIP cleaning, the product contact surface of the device shall be substantially flush with the inner surface of the tank.

**E12**  **Sanitary Tubing**

**D15.2E12.1** Tubing and related fittings within the tank shall be readily and easily removable for cleaning outside the tank or be designed for mechanically cleaning. If designed for mechanically (CIP) cleaning, the tubing and all related fittings shall be self-draining.

**E13**  **Fittings**

**D8E13.1** All sanitary fittings and connections shall conform with to the applicable provisions of the 3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products, Number 63-, except that materials conforming to Cl.1D1.2.1 or Cl.2D1.2.2 may be used for caps of sanitary design for the protection of terminal ends of sanitary tubes, fittings or vents.

**D15.1E13.2** Clamp type fittings shall not be used within the lining.

**D9E13.3** The breast shall be integral with or welded to the lining, and shall be sloped so that drainage is away from the lining. The junction of the breast and the shell shall be welded or effectively sealed.

**D18E13.4** Vents: A vent(s), if provided, shall be of a hooded type of sufficient free opening area to prevent back pressure during filling and to prevent vacuum during emptying of the tank. It shall be in the front head near the top of the tank or in the top of the tank. The vent(s) shall terminate in the milk house or milk room. It shall be provided with a perforated cover having openings not greater than 1/16 in. (1.59 mm) diameter, or slots not more than 1/32 in. (0.794 mm) wide. Woven wire mesh shall not be used for this purpose. It shall be so designed that parts are readily accessible and readily removable for cleaning.

**D20E13.5** Sample Cock: A sample cock must be provided when a sample cannot be readily obtained from a top opening or a sample port opening in the tank. It shall be of a type that has its sealing surface relatively flush with the product contact surface of the tank and have an inside diameter no less than that of 1 in. (25.4 mm) 3-A sanitary tubing.

**D13E13.6** Outlet valves: Valves, when provided, shall conform to D8E13.1 or if the valve is within the lining or in the outlet passage, and the seat is an integral part of the lining or the outlet passage, a compression-type valve conforming to the applicable provisions of D13E13.6.1 may be used. A cap conforming to D8E13.1 shall be provided for the outlet end of valves furnished with tanks.

**D13E13.6.1** Compression-type valve in the tank or outlet passage. This type of valve shall have a metal to metal or rubber or rubber-like material to metal seat. The rubber or rubber-like material may be either removable or bonded. The handle or valve operating rod shall extend above the bridge or main cover or the handle shall be outside the shell.
FABRICATION OF NON-PRODUCT CONTACT SURFACES

The most current approved version of the 3-A Sanitary Standard for General Requirements, 00- shall apply, unless otherwise noted herein with additions, clarifications, exceptions, modification or exclusions.

Surfaces (Refer to 3-A Sanitary Standard for General Requirements, 00-)

Nonproduct Contact Surfaces: Nonproduct contact surfaces shall comply with the following:

They shall be smooth, free of pockets and crevices, and be readily cleanable.

Joints (Refer to 3-A Sanitary Standard for General Requirements, 00-)

The shell shall be effectively sealed against moisture and vermin at all joints and at junctions with the breast, manhole openings, outlets and other openings.

Outside welds need not be ground.

Coatings (Refer to 3-A Sanitary Standard for General Requirements, 00-)

Surfaces to be coated shall be effectively prepared for coating.

Cleaning and Inspectability (Refer to 3-A Sanitary Standard for General Requirements, 00-)

Draining (Refer to 3-A Sanitary Standard for General Requirements, 00-)

A vent or weep hole may be provided in the shell. If provided, it shall be located in a position that will provide drainage from the shell and shall be vermin proof.

Water Compartment

The water compartment of an adjoined tank designed for refrigerated water cooling shall have a cover. The clearance between surface of the cover and surface of the water compartment it is designed to contact shall not exceed 1/16 in. (1.59 mm)

Supports (Refer to 3-A Sanitary Standard for General Requirements, 00-)

Tank Supports: The means of supporting a tank designed to be installed wholly within the milk house or milk room or the means of supporting the portion of a tank that will be in the milk house or milk room shall be one of the following:
D21.1F6.2 With legs: Adjustable legs shall be of sufficient number and strength and so spaced that the filled tank will be adequately supported. Legs shall have closed bases. Exteriors of legs and leg sockets shall be readily cleanable. Legs shall be such that will provide (1) the minimum distance between lowest interior surface of the outlet connection and the floor will be 4 in. (102 mm) and (2) a minimum clearance of 6 in. (152 mm) between the floor and the bottom of a tank 72 in. (183 cm) or less in diameter or width, except in the case of a V-bottom or a rounded bottom tank of which the outer shell slopes continually upward from the outlet centerline, in which case the minimum clearance may be 4 in. (102 mm) if it increases to 6 in. (152 mm) within a horizontal distance of not more than 12 in. (305 mm) on each side of this centerline. On a tank more than 72 in. (183 cm) in diameter or width, the minimum clearance shall be 8 in. (204 mm). (Where Weights and Measures Codes require that a seal be placed on the legs to detect height adjustment after the tank has been leveled or calibrated, the holes for the seals shall be designed and located, or sealed, to prevent entrance of moisture into the legs.)

F7 Name and/or Information Plates (Nameplates) (Refer to 3-A Sanitary Standard for General Requirements, 00-)

E26 NAME AND INFORMATION PLATES

F7.1 All Farm Milk Storage Tanks shall have a name or information plate permanently attached to the tank.

F7.2 Name and information plates shall be continuously welded or effectively sealed to the equipment, except on components listed in Section E26.4 where rivets are allowed.

F7.3 Non-metallic, adhesive-backed, name and information plates are also acceptable.

F7.4 Rivets shall not be used, except on the nameplates of gear reducers, pneumatic cylinders, motors, electrical enclosures, and instrument transmitter housings.

F7.2 Information plate, when necessary to convey additional or special information, shall be attached in juxtaposition to the name plate.

F7.3 Name or information plate(s) for all Farm Milk Storage Tanks shall provide the following information:

a. The manufacturer’s name, model number, and 3-A standard number;

b. The date (month and year) of manufacture;

c. The time the agitator was designed to be in operation to obtain the homogeneity required in D14 with text such as: “The agitator of this tank is designed so that it must be in continuous operation * minutes before removing a product sample.”;
The designed installation location of the portion of the agitator shaft(s) outside the Farm Milk Cooling and Storage Tank with text such as: “The agitator of this farm tank is designed so that the portion of agitator shaft outside of the farm tank ** in the milk room.”;

**Insert one of the following:
(a) “does not have to be”
(b) “must be”

F8 Mounting

F8.1 Slabs, Islands, or Floors

D21.2 Mounted on a slab, or island, or floor: The base of the tank shall be such that it may be sealed to the mounting surface. (See Appendix, Section J6)
F9 THERMOMETER SPECIFICATIONS
[Appendix “I” moved to normative Section “F” in T-30-01-A]

F9.1 INDICATING THERMOMETERS USED IN STORAGE TANKS
Scale Range: S shall have a span not less than 50°F (28°C), including normal storage temperatures ±5.0°F (±2.8°C), with extension of scale on either side permitted; graduated in not more than 2.0°F (±1.1°C) divisions. Temperature Scale Divisions: shall be spaced not less than then 1/16 in. (1.59 mm) apart between 35°F (2.0°C) and 55°F (13.0°C). Digital thermometers shall have 0.30 in. (8.0 mm) digits as a minimum. Accuracy: shall be within ±2.0°F (±1.1°C), throughout the specified scale range. Stem Fitting: S shall conform to the 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections, Used on Fluid Milk and Milk Products Equipment, Number 74- or shall be a stem fitting that does not pierce the lining or means shall be provided to permit securely fastening the temperature sensing element to the outer surface of the lining.

F9.2 RECORDING THERMOMETERS USED IN STORAGE TANKS
F9.2.1 Farm Milk Storage Tanks shall be installed with an approved temperature recording device.
F9.2.2 Case: shall be moistureproof under operating conditions in a milk house or milk room.
F9.2.3 Scale: S shall have a scale span of not less than 50°F (28°C), including normal storage temperature ±5.0°F (±2.8°C), graduated in not less than 2.0°F (±1.1°C) divisions with not more than 40°F (10°C per 1 cm) per in. of scale; graduated in time scale divisions of not more than 1 hr having a chord or straight line length of not less than 1/8 in. (3.18 mm) at 40°F (4.4°C). Divisions spaced not less than 0.040 in. (1.00 mm) apart are permitted when the ink line is thin enough to be easily distinguished from the printed line and graduated in time scale division of not more than 1.0 hr, having a chord of straight-line length of not less than 0.125 in. (3.18 mm) at 40°F (5°C). Chart must be capable of recording temperatures up to 180°F (82.83°C). (Span specifications do not apply to extensions beyond 100°F or 38.0°C.)
F9.2.4 The temperature accuracy: shall be within ±2.0°F (±1.0°C), between specified range limits.
F9.2.5 The pen-Arm setting device: shall be easily accessible; and simple to adjust.
F9.2.6 The pen and Chart Paper: shall be designed to give a line not over 1/40 in. (0.64 mm) thick when in proper adjustment; and shall be easy to maintain.
F9.2.7 The Temperature sensor: shall be protected against damage at 212°F (100°C).
F9.2.8 Stem Fitting: S shall conform to the 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Fluid Milk and Milk Products Equipment, Number 74- or shall be a stem fitting that does not pierce the lining or means shall be provided to permit securely fastening the temperature sensing element to the outer surface of the lining.
F9.2.9 Chart Speed: The circular chart shall make one revolution in not more than 7 days and shall be graduated for a maximum record of 7 days. Strip chart shall move not less than 1.00 in. (25.4 mm) per hour and may be used continuously for one calendar month.

F9.2.9.1 Electronic data acquisition is acceptable and shall provide at least the same information as provided by circular recording thermometers.  

G SPECIAL CONSIDERATIONS

D22G1 Prevention of a Significant Product Temperature Increase. The tank shall be capable of preventing, in 18 hr, an average product temperature increase greater than 3°F (1.7°C) in a tank filled to 100% of its capacity with product when the average difference between the temperature of the atmosphere surrounding the tank and the temperature of the product in the tank is 30°F (17°C). This may be accomplished by one of the following methods:

D22G1.1 Insulation
If the prevention of a significant product temperature increase is to be accomplished solely by insulation, the insulating material over nonrefrigerated areas of the tank shall have an insulating value equivalent of not less than:

D22G1.1.1 Two inches (50.8 mm) of cork on
(1) tanks to be installed wholly within a building
(2) the portion of the tank within a building on tanks to be installed partially outside of a building

D22G1.1.2 Three inches (76.2 mm) of cork on the portion of the tank outside of a building on tanks designed to be installed partially outside of a building.

D22G1.2 A combination of insulation and sufficient refrigerated surface.

D23G2 Insulation: Shall be of a nature and installed in a manner that will prevent shifting or settling.

D24G3 The tank shall have a measuring device. If it is of the immersion type of the direct reading gauge type, it shall comply with D24.1G3.1 or D24.2G3.2.

D24G3.1 Immersion Type: An immersion measuring device shall comply with the applicable provisions of the code entitled "Farm Milk Tanks" in the National Bureau of Standards Handbook 44.

G3.1.1 The measuring rod shall have graduation marks not less than 0.005 in. (0.125 mm) in width and not exceeding 0.008 in. (0.200 mm) in depth. The measuring rod consists of a graduated portion, a seat

5 See Grade "A" Pasteurized Milk Ordinance, U.S. Department of Health and Human Services, Food and Drug Administration Appendix H.V. CRITERIA FOR THE EVALUATION OF ELECTRONIC DATA COLLECTION, STORAGE, AND REPORTING.
to engage the measuring rod supporting bracket or other supporting means and a handle. It does not include the supporting bracket or other supporting means. The measuring rod may be two or more parts welded together or may be one piece. The handle shall extend above the bridge or main cover, or shall be located outside of the outer shell. The tank serial number stamped or etched on the rod shall be located as high on the rod as is practicable. The opening through which the measuring rod extends shall be protected against liquids or other contaminants entering the tank from that portion of the measuring rod outside the tank.

**D24G3.2 Direct Reading Gauge:** A direct reading gauge shall comply with the applicable provisions of the code entitled "Farm Milk Tanks" in the National Bureau of Standards Handbook 44. A direct reading gauge shall be provided on all farm milk storage tanks with a capacity greater than 2000 gal or 8000 L. A direct reading gauge of the glass or plastic tube type shall be sanitary in design and construction and shall be readily accessible for cleaning or shall be designed for mechanical cleaning. It shall be designed and constructed so that product in the gauge will automatically be discarded. The valve shall be close coupled. The distance, measured along the passage for the product in the tank to the gauge valve, from the nearest point on the shell to the ferrule or flange for the valve shall not be more than the smaller of (1) twice the nominal diameter of the passage or (2) five in. (127 mm).
APPENDIX

The most current approved version of the 3-A Sanitary Standard for General Requirements shall apply, unless otherwise noted herein with additions, clarifications, exceptions, modification or exclusions.

E1 STAINLESS STEEL AND EQUIVALENT MATERIALS (Refer to 3-A Sanitary Standard for General Requirements, 00-)

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section CD1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 Series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. The chemical compositions of these cast grades are covered by ASTM specifications A351/A351M, A743/A743M and A744/A744M.

F2 PRODUCT CONTACT SURFACE FINISH (Refer to 3-A Sanitary Standard for General Requirements, 00-)

2.1 Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of Section D1E1.1 herein. A maximum $R_a$ of 32 µin. (0.8 µm), when measured according to the recommendations in American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME) B46.1 - Surface Texture, Waviness and Lay is considered to be equivalent to a No. 4 finish.

2.2 Surface finish on sheets (less than 3/16 in. (4.76 mm) thickness) of 2B (cold rolled) stainless steel, inspected and selected to be free of pits, folds and crevices, are generally found to be as smooth as, or smoother, than stainless steel sheets with an $R_a \leq 32$ µin. ($\leq 0.8$ µm) finish and are acceptable for the fabrication of equipment if free of imperfections.

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6 Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Phone: (610) 832-9500.

7 Available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017-2392.
3 ENGINEERING DESIGN AND TECHNICAL CONSTRUCTION FILE (Refer to 3-A Sanitary Standard for General Requirements, 00-)

The maintenance of this file is required for an application for Authorization to Display the 3-A Symbol and will be evaluated during the required Third Party Verification (TPV) evaluation of the equipment. Where indicated in the following examples, appropriate information should be completed by the fabricator.

4 INSTRUCTION HANDBOOK FOR INSTALLATION, MAINTENANCE, AND CLEANING
(Refer to 3-A Sanitary Standard for General Requirements, 00-)

5 SUGGESTED CLEANING PROCEDURES

G5.1 MANUAL CLEANING
If the inside height of a tank exceeds 96 in. (244 mm cm), one means for manual cleaning is to weld a stainless steel rung on each end of the tank to support a removable platform at a height which will facilitate cleaning and inspection.

J6 SLABS, OR ISLANDS, OR FLOORS
When a tank the equipment is designed to be installed on a slab, or an island, or floor, the dimensions of the slab or island mounting should be such that the tank will extend beyond the slab or island at least 1 in. in all horizontal directions. The slab or island should be of sufficient height so that the bottom of the outlet all product connections is are not less than 4 in. 24 in. (610 mm) above the floor. The surface of the slab or island should be coated with a thick layer of waterproof mastic material, which will harden without cracking. The junction of the outer shell of the tank equipment base and the slab, or island, or floor should be effectively sealed.

7 HARMONIZATION (Refer to 3-A Sanitary Standard for General Requirements, 00-)

H8 VACUUM PIPING
When vacuum piping is provided, the piping downstream from an elbow connected to the vacuum connection on the tank (see D11.8E8.16) should pitch downward from the tank to a moisture trap. The piping between the tank vacuum connection and the moisture trap should be stainless steel and have a slope of not less than 1 in. in the first 12 in. (83 mm in the first m).